



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of
WINDMULLER et al.

Appln. No. 10/563,377

Filed: April 27, 2006

FOR: PROCESS FOR THE PRODUCTION OF A POLYMER COMPRISING
MONOMERIC UNITS OF ETHYLENE, AN α -OLEFIN AND A VINYL
NORBORNENE

Confirmation No. 4401

Atty. Ref.: 4662-129

T.C. / Art Unit: 1796

Examiner: C.C. Lu

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DECLARATION OF GERARD H.J. VAN DOREMAELE UNDER 37 C.F.R. §1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Gerard H.J. van Doremaele, do hereby declare as follows:

1. I have a PhD in Polymerisation Chemistry, did a postdoc in organometallic chemistry at Caltech with prof. Grubbs (Noble Prize Laureate), and have been working as research chemist and project leader in the field of polyolefin research at DSM for 16 years. My current title is research competence manager Polymerisation Chemistry and Catalysis.

2. I am an employee of DSM, which is affiliated with DSM IP Assets B.V., the assignee of U.S. Patent Application Serial No. 10/563,377 ("The '377 application"), filed April 27, 2006.

3. I am a co-inventor, along with Peter H. WINDMULLER of the '377 application.

4. I have read and I am familiar with U.S. Patent No. 6,583,082 (referred to herein as "Hoang") and PCT Application WO 97/38019 (referred to herein as "Gillis").

which has been cited during the prosecution of the subject application (the '377 application).

5. I have read and I am familiar with the subject matter of the '377 application and I have read and I am familiar with the current pending claims 4 and 11 in the Amendment submitted on November 17, 2008.

6. I have read the Office Actions mail dated May 15, 2008 and November 1, 2007 for the '377 application and I understand that claims 4 and 11 of the '377 application is being rejected over Hoang and Gillis as allegedly obvious.

7. Our Invention, as claimed in pending claims 4 and 11 of the '377 application is not obvious in view of Hoang and Gillis at least because we have found unexpected results.

8. I have read the Examiner's statement indicating that Example 4 and Comparative Example C in the '377 application are not comparable because of differences in the catalyst used.

9. In my view, the catalyst used in Example 4 and Comparative Example C are comparable. Example 4 and Comparative Example C in the '377 application are comparable because they used highly similar pro-catalysts that are similar once they are in active form. The catalyst for Example 4 is η^5 -

(perfluorophenylcyclopentadienyl)(tri-tert-butylphosphinimine)titanium dimethyl. The catalyst for Comparative Example ^C is η^5 -(perfluorophenylcyclopentadienyl)(tri-tert-butylphosphinimine)titanium dichloride. The procatalysts have identical spectator ligands, viz. perfluorophenylcyclopentadienyl)(tri-tert-butylphosphinimine ligand. The

only difference between the two catalysts is the methyl vs. chloride group as the activatable ligands. The activatable ligand is activatable because aluminoxane or an other activator like a borate will activate the catalyst by removing this ligand, thus creating an open site for C2, C3 or diene insertion. Once activated by aluminoxane or an other activator like a borate, the two catalytic species are similar, having the same spectator ligands. This can also be learned from Hoang Col 7 lines 14 - 32, where Cl (line 24) and Me (line 20) are mentioned as "leaving ligands" and being considered as interchangeable (line 40). For this reason the organo-metallic compound is often referred to as "procatalyst".

10. As the Examiner indicated that the experimental conditions are different, I submit that the dosed amounts of C2 and C3 have been erroneously interchanged. This obvious error could be concluded from the resulting polymer composition, that could not be obtained with a C2/C3 ratio of 1139/836 (NL/g), but only with a ratio of 836/1139 (NL/g). I further found that the C2/C3 dosing of Examples 8 and 9 have been interchanges as well. Dosing of C2 was less than the dosing of C3 in all Examples. Example 8 dosing should read for C2 and C3 900 and 1123 respectively. Example 9 dosing should read for C2 and C3 899 and 1125 respectively. If this should still be not convincing one may compare Example 4 with Comparative Experiment A, in which the same catalyst precursor is used.

11. In the description at page 13, Example 4 verses comparative Experiment C, it is clearly shown that the polymerization of Example 4 according to the present invention allowed ten times more VNB than a polymerization in the presence of a borate co-catalyst to obtain a similar amount of branching in terms of $\Delta\bar{D}$.

12. Furthermore, Example 8 versus Comparative Experiment C shows that under similar conditions and the same amount of VNB incorporated, the MAO activated sample was hardly branched in terms of $\Delta\delta$, while the borate activated sample was highly branched in terms of $\Delta\delta$.

13. Example 3 shows that even with a very high dosing of VNB, a polymer could be made without excessive gelation or reactor fouling. To the best of my knowledge this has been never shown with a borate cocatalyst. Under the applied conditions dosing more than 50 mmol VNB/L solvent, which is an extremely high amount, shows higher long chain branching than Example 4 which has lower amounts of VNB dosing. However, Example 10 shows, under milder conditions, the amount of branching can be brought back to the level of Example 4 with even more built in VNB. I note that these high amounts of VNB dosing were not possible at all under economically feasible conditions in the state of the art at the time of the invention.

14. The purpose of our invention was to build in VNB not for the purpose of introducing branching as Gillis, but to introduce vinyl unsaturation to a level required for peroxide vulcanization. Our results, allowing a 10 time more VNB compared to Gillis without significant reactor fouling and without noticeable gelling and leading to a degree of branching comparable to that achieved with a ten fold lower amount of VNB when using another catalyst system are all unexpected. I would not have expected to achieve this result without performing the experiments as outlined in the '377 application). The highest amount of dosed VNB in Gillis is disclosed in Experiment 7, where 0.5 ml VNB is dosed. With a VNB density of 0.841 g/ml this corresponds to 0.42 gram VNB. Starting

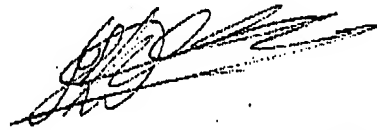
from the presumption that all VNB has been incorporated in the 91 gram of polymer formed, this corresponds with at most 0.46 % VNB in the polymer.

15. I would also like to address the Examiner's statement, on page 4 of the November 11, 2007 Office Action, which states that metallocene catalyst 2 with a polar perfluorophenyl substituent on the cyclopentadienyl ring is not representative of the metallocene catalyst of the instant claims. I have reviewed the instant claim 11 as amended by the amendment of November 17, 2008 and determined that metallocene catalyst 2 is indeed a metallocene catalyst of the instant claim 11 where Cp is a ligand selected from the group consisting of cyclopentadienyl, substituted cyclopentadienyl, indenyl, substituted indenyl, fluorenyl and substituted fluorenyl. A perfluorophenylCp ligand is an example of substituted cyclopentadienyl. It is clear that claim 11, as amended in the amendment of November 17, 2008, reads on metallocene catalyst 2. Therefore, Example 4 is commensurate with the scope of the instant claims.

16. I would also like to address the Examiner's comment that Example 3 has a much lower $\Delta\delta$ of 1.5 compared to Example 4 with a $\Delta\delta$ of 9.0. The Examiner has alleged that the claimed process does not always produce the terpolymer with low level of long chain branching. I note that "low level of long chain branching" as such is not part of the instant pending claim 4 or 11. The objects of the invention is to produce a polymer with a high VNB content, to have a fast curable EPDM while avoiding gelation. Although the degree of branching of Example 3 is higher than that of Example 4, the amount of build in VNB is also 20% higher. This represents a significant advantage as less peroxide is required for curing – thus reducing the overall cost of the curing process.

17. I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: Nov. 25 2008



Gerard H.J. van Doremaele